

## REMARKS

Claims 1-42 were pending of which Claims 36-42 were withdrawn from consideration, and Claims 1-35 were rejected. Claims 1 and 31 have been amended and Claims 36-42 have been cancelled.

### Claim Rejections – 35 U.S.C. §102

Claims 17-20, 23-26, 28-30 were rejected under 35 U.S.C. §102(e) as being anticipated by Wu (6,769,773) (“Wu”). Applicant respectfully traverses.

Independent Claim 17 recites “a light emitting diode comprising a chip having a light emitting surface, wherein the light emitting surface is not covered by an encapsulant such that the light emitting surface emits light directly into the ambient environment”.

Wu discloses that a UV light emitting diode (LED) chip is used as a UV light source. Wu does not disclose that the light emitting surface of the chip is “not covered by an encapsulant such that the light emitting surface emits light directly into the ambient environment.”

As is discussed in detail in the specification of the present application, the emission of light into a medium with a low refractive index, such as the ambient environment, is important because it reduces the étendue and, thus, increases the luminance of the LED. See, e.g., paragraphs 31, 34-35. Wu simply does not disclose or even suggest the desirability of such a configuration, nor is such a configuration inherent in Wu.

Accordingly, Wu fails to teach or suggest all the limitations of Claim 17. Thus, Applicant respectfully submits that Claim 17 is patentable over Wu. Reconsideration and withdrawal of this rejection is respectfully requested. Claims 18-20, 23-26, 28-30 depend from Claim 17 and are, therefore, likewise patentable.

### Claim Rejections – 35 U.S.C. §103

Claims 1-5, 32, and 34-35 were rejected under 35 U.S.C. §103(a) as being unpatentable over Waitl et al. (6,610,563) (“Waitl”) in view of Takushima et al. (6,522,810) (“Takushima”).

Applicant submits that there is no motivation to combine Waitl and Takushima. The Examiner incorrectly states that “Takekuma (sic, Waitl) and Takushima et al. have

substantially the same environment of a LED having a layer of similar resin coating material". Waitl is related to an LED in which the semiconductor chip 11 is covered with a casting compound 14, such as epoxy resin, and that is covered with a lens 16. See, col. 6, lines 36-41. Thus, the casting compound 14 in Waitl is sandwiched between the semiconductor chip 11 and the lens 16. Takushima, on the other hand, is related to an optical waveguide and does not include an LED. Moreover, Takushima discloses that the waveguide includes an external coating layer 13 that surrounds a cladding region 12. See, col. 4, lines 21-23, Fig. 1A. According to Takushima, it is the external coating layer 13 in Takushima that is "preferably a resin" with a "refractive index of the coating layer is preferably at least 1.25 but not exceeding 1.65". Col. 2, lines 33-37. There is no similarity between the structures in Waitl and Takushima and no reason that one of ordinary skill in the art would be motivated to use the teaching of Takushima with Waitl. Therefore, contrary to the Examiner's statement it would **not** have been obvious that the index of refraction in Waitl is 1.25.

Further, Waitl does not teach or suggest a "a collimating optical element disposed to receive the light emitted from the light emitting surface of the chip,". The Examiner cites the plane-convex convergent lens 16 in Waitl as a collimating optical element, but there is no disclosure that lens 16 collimates the light produced by the chip 11 in Waitl.

Nevertheless, in order to expedite prosecution and not reasons related to patentability, Claim 1 is amended to recite "a light emitting surface that emits light into a medium with a refractive index of less than .1.25". As noted by the Examiner, Takushima discloses that the resin is at least 1.25.

Thus, Applicants respectfully submit that Claim 1 is patentable over the combination of Waitl and Takushima. Reconsideration and withdrawal of this rejection is respectfully requested. Claims 2-5 depend from Claim 1 and are, therefore, likewise patentable.

Regarding Claims 32 and 34-35, they depend from independent Claim 31. Independent Claim 31 recites a "a micro-display" which is disclosed in neither Waitl nor Takushima. Accordingly, Claim 31 is patentable over the combination of Waitl and Takushima and Claims 32 and 34-35, which depend from Claim 31 must be likewise patentable over the combination of Waitl and Takushima. Reconsideration and withdrawal of this rejection is respectfully requested.

In addition, as discussed above, Applicant submits that there is no motivation to combine Waitl and Takushima and that even if combined they do not teach a collimating optical element, as recited in Claims 31 and 32.

Further, Waitl does not disclose the “light emitting diode further comprises a submount” and “the holding element being mounted on the submount”, as recited in Claims 34 and 35 (and Claims 4 and 5).

Claims 6 and 12 were rejected under 35 U.S.C. §103(a) as being unpatentable over Waitl in view of Takushima further in view of Ishinaga (6,180,962) (“Ishinaga”).

Claims 6 and 12 depend from Claim 1. Ishinaga does not make up for the deficiencies of Waitl and Takushima. Accordingly, Claims 6 and 12 are patentable for at least the same reasons as Claim 1. Reconsideration and withdrawal of this rejection is respectfully requested.

Moreover, Applicant points out that Claim 6 recites “the light emitting diode further comprises a submount, the chip being mounted on the submount, and wherein the holding element is mounted on the submount by reflow soldering.” Thus, both the chip and the holding element are mounted on the submount. Waitl, Takushima and Ishinaga alone or in combination do not disclose such a structure.

Claim 12 recites “the light emitting diode further comprises a submount and an array of chips mounted on the submount”. Again, Waitl, Takushima and Ishinaga alone or in combination do not disclose such a structure.

Claims 7, 13-16, 31, and 33 were rejected under 35 U.S.C. §103(a) as being unpatentable over Waitl modified by Takushima further in view of Wu.

Claims 7 and 13-16 depend from Claim 1. Wu does not make up for the deficiencies of Waitl and Takushima. Accordingly, Claims 7 and 13-16 are patentable for at least the same reasons as Claim 1. Reconsideration and withdrawal of this rejection is respectfully requested.

Moreover, Applicant points out that Claim 14 recites “the chip includes one of a wavelength converting layer, a diffractive layer, a micro-refractive layer, and a filter layer and a polarizer layer that forms the light emitting surface.” Wu discloses a “rotating fluorescent plate 71”. Clearly plate 71 is not part of the UV light source 70 in Wu, as plate 71 rotates which “sequentially generates red, green and blue colors”. Col. 3, lines 36-48.

Further, with regard to Claims 15 and 16, Waitl discloses that the light is emitted into a casting compound 14, such as epoxy resin, and then through the lens 16. The Examiner's rejection relies on Takushima to modify Waitl so that the casting compound 14 has a refractive index of 1.25. In the rejection of Claims 15 and 16, however, the Examiner cites Wu for the proposition that the medium is not Waitl's casting compound 14, but is the "ambient environment". Applicant submits that such a combination of Waitl, Takushima and Wu is inappropriate and nonsensical.

Regarding independent Claim 31, Wu does not make up for the deficiencies of Waitl and Takushima. As discussed above in reference to Claim 1, it would not have been obvious based on Takushima that the index of refraction in Waitl is 1.25. Wu does not make up for that deficiency.

Nevertheless, in order to expedite prosecution and not reasons related to patentability, Claim 31 is amended to recite "a light emitting surface that emits light into a medium with a refractive index of less than .1.25". As noted by the Examiner, Takushima discloses that the resin is at least 1.25.

Thus, Applicants respectfully submit that Claim 31 is patentable over the combination of Waitl, Takushima and Wu. Reconsideration and withdrawal of this rejection is respectfully requested. Claim 33 depends from Claim 31 and is, therefore, likewise patentable.

Claims 8-11 were rejected under 35 U.S.C. §103(a) as being unpatentable over Waitl modified by Takushima further in view of Taskar et al. (6,734,465) ("Taskar").

Claims 8-11 depend from Claim 1. Taskar does not make up for the deficiencies of Waitl and Takushima, which are discussed above. For example, Taskar discloses the use of a "nanophosphor downconverter 10" that is molded as a lens over the LED chip 11. Col. 5, lines 61-65. The nanophosphor downconverter 10 has a refractive index greater than 1.3. See, col. 5, lines 64-65 and col. 3, line 60 to col. 4, line 13. Taskar also discloses the use of a "nanophosphor downconverter 13", which has a "a high refractive index composite." Col. 6, lines 3-8. Accordingly, Claims 8-11 are patentable for at least the same reasons as Claim 1. Reconsideration and withdrawal of this rejection is respectfully requested.

Claims 21-22 and 27 were rejected under 35 U.S.C. §103(a) as being unpatentable over Wu in view of Waitl.

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Claims 21-22 and 27 depend from Claim 17. Waitl does not make up for the deficiency of Wu. In fact, Waitl discloses that the semiconductor chip 11 is covered with a casting compound 14, which is not the ambient environment as claimed in independent Claim 17. Thus, Claims 21-22 and 27 are patentable for at least the same reasons as Claim 17. Reconsideration and withdrawal of this rejection is respectfully requested.

In addition, contrary to the Examiner's statement, Waitl does not disclose a submount. The submount 3' that is cited by the Examiner is the same element as the holding element 3 cited by the Examiner. Waitl disclose a high-temperature thermoplat housing 3 with respect to Fig. 1 and a housing 3' with respect to Figs. 2A, 2B, 2C. Waitl states "the housing 3' differing from the housing 3' [sic, 3] illustrated in Fig. 1 only the extent that the surface 5 of the housing 3' is provided with a ring groove 6 that surrounds the recess 4". Thus, Waitl does not disclose a submount 3, which is required in Claims 21, 22, and 27.

Further, neither Wu nor Waitl disclose an array of chips mounted on a submount, as recited in Claim 27.

Claims 1, 31 have been amended and Claims 36-42 have been cancelled leaving Claims 1-35 pending. For the above reasons, Applicants respectfully request allowance of Claims 1-35. Should the Examiner have any questions concerning this response, the Examiner is invited to call the undersigned at (408) 982-8202.

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